US Army Corps
of Engineers
Omaha District

GARRISON PROJECT, NORTH DAKOTA

DOWNSTREAM CHANNEL AND SEDIMENT TRENDS STUDY

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CHAPTER I - INTRODUCTION

PURPOSE

This report documents historic channel and sediment data on the Missouri River below Garrison Dam (Garrison Degradation Reach). It will serve as 1) a reference document of pertinent hydraulic, geometric, and geomorphic data and 2) an appendix for future technical reports that will present detailed analyses, correlations, and conclusions. Existing data and background information are utilized with no additional surveys or data development undertaken.

SCOPE

The study area encompasses the 54 mile reach of the Missouri River from Garrison Dam (1960 River Mile 1389.9) to about 20 miles north of Bismarck, ND (1960 River Mile 1336). Location maps are found on Plates 1, 2 and 3.

Data compiled for this report include historic channel geometry, water surface profiles, stage-discharge relationships, bed samples and bank erosion rates. Most original data presented was collected in the mid 1940's; however, some discharge data dates back to 1929 and bank erosion information goes back to 1938.

The report format assembles data and background information in the form of discussions, tables, and plots to identify any significant trends in the geomorphic character of the river study reach.

CHAPTER IV - SUMMARY OF TREND EVALUATION

Since the closure of Garrison Dam in 1954 many changes in the characteristics of the river have taken place, as expected of a channel below a dam. Degradation has occurred along the whole reach, however, the magnitude of this bed lowering decreases as the distance downstream from the dam increases (the bed has lowered approximately 8 feet near the dam and about 3 feet at the lower reach). The difference in discharges between the high and low extremes have been reduced since closure. Gaging stations showed a decrease in stage until the late seventies and early eighties when they tended to stabilize. Grain size has become coarser with time with the coarsest material found immediately downstream of the dam. The rate of bankline erosion decreased dramatically following closure of Garrison Dam and has continued to decrease with time (some of the decrease is a result of bank stabilization projects). Finally, the Knife River's bed has lowered as the result of headcutting.

Table 8 is a qualitative summary of these and channel geometry changes, for the active channel, from 1958 to 1985. Thalweg elevation has decreased at most sediment range locations and the average bed elevation has decreased at all locations. The cross sectional area for a discharge of 20,000 c.f.s. has shown a decreasing trend for the first 28 miles below the dam and an increasing trend for the last 26 miles of the reach. Grain size has increased in all but two locations in the upper half of the river and has increased in slightly more than half of the locations on the lower part.

TABLE 8

QUALITATIVE ACTIVE CHANNEL CHANGES 1958 TO 1985

FOR A DISCHARGE OF 20,000 CFS

1960 R.M.	THAL-WEG ELEV	AVE. BED ELEV.	AVE. DEPTH	WIDTH	AREA	D50 GRAIN SIZE
1388.19	-	-	-	+	-	+
1387.09	-	-	+	-	-	+
1385.88	-	-	-	+	-	+
1384.86	-	-	-	-	-	+
1383.33	-	-	+	-	-	+
1382.25	-	-	*	-	-	-
1381.34	-	-	-	-	-	+
1380.43	-	-	+	-	-	+
1379.68	-	-	-	+	-	+
1379.00	-	-	-	+	-	+
1378.42	-	-	*	*	-	+
1377.53	*	-	-	+	-	+
1376.71	-	-	-	-	+	+
1375.89	-	-	-	-	-	+
1374.91	-	-	-	-	-	+
1374.58	-	-	*	-	-	+
1373.80	+	-	+	+	+	+
1372.50	-	-	+	*	+	+
1371.37	-	-	-	-	-	+
1370.29	+	-	*	*	-	+
1368.89	*	-	-	+	+	+
1367.40	-	-	-	-	-	+
1366.24	-	-	+	-	-	+
1364.87	+	-	+	-	-	+
1363.86	+	-	-	-	-	+

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TABLE 8 (CONTINUED)

QUALITATIVE ACTIVE CHANNEL CHANGES 1958 TO 1985

FOR A DISCHARGE OF 20,000 CFS

1960 R.M.	THAL-WEG ELEV.	AVE. BED ELEV.	AVE. DEPTH	WIDTH	AREA	D50 GRAIN SIZE
1362.55	+	-	-	+	-	-
1360.40	-	-	+	-	-	-
1358.50	*	-	-	+	+	+
1356.50	*	-	+	+	+	+
1353.85	+	-	-	-	-	+
1351.83	+	-	-	*	*	+
1349.46	-	-	-	+	+	+
1346.46	-	-	+	+	+	-
1344.72	-	-	+	-	-	-
1343.30	-	-	-	+	-	-
1341.40	+	-	-	+	+	+
1339.67	-	-	*	+	+	-
1338.05	-	-	+	+	+	+
1336.82	-	-	-	+	+	-
1335.91	-	-	*	-	+	+

* NO CHANGE OR INCOMPLETE DATA
- MEASURED UNITS HAVE DECREASED FOR THAT PARAMETER OR MSL ELEVATION HAS DECREASED
+ MEASURED UNITS HAVE INCREASED FOR THAT PARAMETER OR MSL ELEVATION HAS INCREASED